

**Effects of avian predation on key fish
species: A bioenergetics model for
piscivorous birds in the Sacramento–San
Joaquin Delta**

Sarah E Spring

Public Comments

No public comments were received for this proposal.

Technical Synthesis Panel Review

Proposal Title

#0112: Effects of avian predation on key fish species: A bioenergetics model for piscivorous birds in the Sacramento–San Joaquin Delta

Final Panel Rating
inadequate

Technical Synthesis Panel (Primary) Review

TSP Primary Reviewer's Evaluation Summary And Rating:

Avian predation on fish, although not causing the decline of fish species of concern, can nevertheless affect population maintenance and recovery. This point is clearly shown by the Caspian Tern situation in the Columbia River. Moreover, it appears that potential waterbird predators have never been censused in the Delta, and certainly their seasonal distributions have never been determined. For these and other reasons, the goals of this proposal are important to CALFED and to Delta conservation in general. However, information given on the study design is often too limited to evaluate critically, and there are problems with key approaches proposed by the authors. First, for stable isotope analysis to be useful in determining what species of fish are eaten by birds, the fish prey of the birds must either (1) eat different prey derived from different carbon sources, or (2) feed at different trophic levels. No rationale is given for whether and how much the fish and their prey are expected to differ isotopically. The best estimate of foodweb structure provided by the authors (Fig. 5, p. 21) suggests that all major prey feed on the same carbon source (mixed POM), so no differences are expected in $\delta^{13}\text{C}$ in the prey of these fish. Moreover, the four fish species of concern feed at the same trophic level, so no differences in $\delta^{15}\text{N}$ are expected.

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Consequently, it is likely that stable isotopes in birds will not be useful in discriminating the relative importance of the four fish species of concern in their diet, or of the other non-native fish. Second, Fig. 6 in fact indicates that birds do not eat the fish species of concern, but only their predators. Thus, bird predation will enhance survival of the fish prey of those fish predators (i.e., a trophic cascade). However, $\delta^{15}\text{N}$ would not indicate whether the predatory fish the birds are eating in turn eat fish species of concern, or rather eat mainly silversides and shiners for which there is no concern. In the first case, bird predation would enhance populations of the fish species of concern by reducing competition with non-native species, whereas in the second case they would enhance competition with species of concern by silversides and shiners. Stable isotopes would not distinguish these two contrasting possibilities, which have opposite implications for effects of avian predators on species of concern. Lack of mention of the above limitations on inference from stable isotopes suggests inexperience with this approach. Because of these limitations, the work will in fact rely on gut contents of collected birds to indicate diet (Double-crested Cormorant, Forster's Tern, Western Grebe, and either Great Egret or California Gull). However, the diets of piscivorous birds usually vary substantially in time and space depending on prey availability, and energetic calculations of the impacts of birds on particular prey will require good resolution of diets at different areas and times relative to the dispersion of birds. For example, birds often focus intense predation on a particular fish species when they are especially available as during a migration or spawning event, but otherwise may eat almost no fish of that species. Because collecting birds over large areas over a long period is very difficult logistically, more specific hypotheses about effects on particular fish species would help focus field sampling efforts. The Delta is a complex, heterogeneous habitat, and the authors plan to stratify their bird population surveys in at least some parts of the survey area. To calculate impacts on fish populations, they need to estimate total numbers of birds in different areas at different times. Birds will be counted in a 250-m strip along each side of an airplane. How will the authors convert counts along sample transects into

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estimates of population densities in different parts of the Delta, and how will they reconcile counts of "all river and slough channels ... including open bodies of water" with stratified surveys of large areas like Suisun Bay? A suitable sampling design with reliable results will require much effort to devise, but in the proposal little attention is paid to this difficult issue. The authors plan to calculate bird densities as number of birds per river kilometer (p. 5); however, it is likely that many of the birds will not be in rivers, but rather in marshes and flooded areas within diked or tidal areas. Better description of the survey approach and analytical methods is needed to evaluate the adequacy of the effort, as well as the budget for population surveys. The authors plan to correlate bird density with fish distribution and abundance. Who will collect these data on fish, and what is the design for collecting them representatively throughout the study area at different times? The authors say these data can be obtained from a web site, but they need to explain how comprehensive these data are in time and space. No mention is made of whether the birds of different species nest in the Delta, and how many do so. This issue is especially relevant to splittail, which migrate through mainly in May after the proposed surveys will be over. The null hypothesis for the proposal is: "Fishes of concern do not constitute significant proportions of piscivorous bird diets." However, the proposal is justified by modeling bird predation impacts on fish. A more compelling and suitable null hypothesis would be that "Piscivorous birds have no significant impact on survival of adult or young fish of particular species." The research approach would need to be expanded in some areas to address this more compelling hypothesis.

Additional Comments:

One reviewer noted that the research group may be larger (and so more expensive) than necessary. The budget for some project elements is high, e.g., \$8,500 for a literature comparison of the diets for four bird species, and \$15,000 to calculate "energy requirements of prey". The latter issue is never mentioned or justified in the proposal - is this to calculate indirect effects of predatory fish on fish of concern at lower

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trophic levels? However, if the project were to be done very thoroughly in terms of measuring the distributions and diets of four bird species and their prey comprehensively in space and time throughout the Delta, this budget is reasonable. One reviewer also commented that none of the PIs have an adequate background in stable isotopes and bioenergetics modeling, and that as a result the proposal is unusually dependent on technical consultants not directly involved with the proposal.

Avian predation on fish, although not causing the decline of fish species of concern, can nevertheless affect population maintenance and recovery. This point is clearly shown by the Caspian Tern situation in the Columbia River. Moreover, it appears that potential waterbird predators have never been censused in the Delta, and certainly their seasonal distributions have never been determined. For these and other reasons, the goals of this proposal are important to CALFED and to Delta conservation in general. However, information given on the study design is often too limited to evaluate critically, and there are problems with key approaches proposed by the authors. First, for stable isotope analysis to be useful in determining what species of fish are eaten by birds, the fish prey of the birds must either (1) eat different prey derived from different carbon sources, or (2) feed at different trophic levels. No rationale is given for whether and how much the fish and their prey are expected to differ isotopically. The best estimate of foodweb structure provided by the authors (Fig. 5, p. 21) suggests that all major prey feed on the same carbon source (mixed POM), so no differences are expected in $\delta^{13}\text{C}$ in the prey of these fish. Moreover, the four fish species of concern feed at the same trophic level, so no differences in $\delta^{15}\text{N}$ are expected. Consequently, it is likely that stable isotopes in birds will not be useful in discriminating the relative importance of the four fish species of concern in their diet, or of the other non-native fish. Second, Fig. 6 in fact indicates that birds do not eat the fish species of concern, but only their predators. Thus, bird predation will enhance survival of the fish prey of those fish predators (i.e., a trophic cascade). However, $\delta^{15}\text{N}$ would not indicate whether the predatory fish

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Technical Synthesis Panel (Discussion) Review

TSP Observations, Findings And Recommendations:

Effects of Avian Predation on Key Fish Species: a Bioenergetics Model for Piscivorous Birds in the Sacramento-San Joaquin Delta

The three reviews did not agree. The lowest ranking review was most thorough, and the panel was in agreement with the lowest external reviewer. The researchers did not state how the data that were collected would be converted into population estimates. There were serious problems with methods.

The researchers did not present a convincing case that they will be able to do the proposed stable isotope work. A major problem with the proposed approach is that no specific

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hypotheses were presented.

The reviewers questioned the qualifications of the investigators for some aspects of the proposal work. In particular, insufficient evidence of stable isotope expertise was presented in the proposal.

Overall, the goals of the study were strong. Reviewers identified too many uncertainties about whether the researchers would be able to deliver results of the proposed work.

Rating: inadequate

Technical Review #1

proposal title: Effects of avian predation on key fish species: A bioenergetics model for piscivorous birds in the Sacramento–San Joaquin Delta

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	Yes. In editorial terms, the text identifying the motivation of the project is straightforward and front-and-center. The motivation is well-founded with respect to both CALFED aims and wider scientific interest.
Rating	excellent

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

Comments	Yes. The background provided in the proposal shows the clear connection of the proposed work to recent progress in bioenergetic modelling and applications of that modelling to conservation and management questions. The conceptual model was presented in clear, understandable terms in Fig. 1.
Rating	excellent

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to

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Technical Review #1

generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	Yes. I have two comments, however. I would have liked to see a justification for the sacrificing of fairly large numbers of birds. Does some reason exist not to use blood samples in the stable isotope analysis? Before funding this full project, perhaps a pilot study should be required to verify that the fish of interest will actually induce unique isotopic signatures in their predators, since a violation of that assumption would render the work a waste of time. Assuming that the project proceeds as described, and that the assumptions made are valid, the project is likely to provide new and critical information for decision makers.
Rating	excellent

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success?
Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	With the exception of my previous comments, yes, the approach is feasible and likely to succeed. The methods are all proven and the investigators appear to have experience with all of them.
Rating	excellent

Monitoring

If applicable, is monitoring appropriately designed (pre–post comparisons; treatment–control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	no experiment is planned
Rating	not applicable

Technical Review #1

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	yes, high value products are likely to be produced, relevant to the entire Central Valley watershed.
Rating	excellent

Additional Comments

Comments	I was quite impressed with the scale of this project, and its blending of different types of appropriate techniques.
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Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	The large group of investigators appear to be well-prepared to execute the proposed work. It may be that the group is larger (and so more expensive) than necessary, but I am persuaded that the scope of the project requires the large group.
Rating	excellent

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	I do not feel well qualified to comment on all aspects of the proposal. Having said that, I saw no obvious problems.
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Technical Review #1

Rating	very good
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Overall

Provide a brief explanation of your summary rating.

Comments	The project is a large scale application of a variety of appropriate techniques, addressing a population biology problem at the ecosystem level. It is well-conceived and likely to produce the products described.
Rating	excellent

Technical Review #2

proposal title: Effects of avian predation on key fish species: A bioenergetics model for piscivorous birds in the Sacramento–San Joaquin Delta

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	The goal of developing a bioenergetics model to quantify the effects of avian predation on fish populations is clearly stated and internally consistent. Avian predation has been shown to remove significant quantity of fish to be an important fish model parameter. Therefore, models that relate fish survival to management actions should include the best possible estimate of this parameter.
Rating	excellent

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full–scale implementation project justified?

Comments	The proposed research project is justified based on prior knowledge of the importance of avian predation in similar ecosystems. The conceptual model is relatively well developed and illustrated in Figure 1.
Rating	good

Technical Review #2

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	The approach is well designed to meet its objectives and will generate novel information. Avian predator abundance will be tracked monthly from November to April, during the fish migration. Yet figure 2 seems to indicate that peak splittail migration occurs in May and runs through June. This inconsistency is not addressed in the text. I would suggest that abundance measures are taken January through June. This would also include more of the piscivore birds' nesting season, when predation should be most concentrated.
Rating	very good

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	The approach is described in detail in the proposal and is technically feasible. The project should have a high probability of success especially if abundance survey months are changed. The scale of the project seems appropriate and the authors seem qualified.
Rating	very good

Monitoring

If applicable, is monitoring appropriately designed (pre–post comparisons; treatment–control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	
Rating	

Technical Review #2

	not applicable
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Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	The information developed in the proposed project should improve fish models that will provide the ultimate interpretable outcome with respect to management actions from this project. Although elsewhere management recommendations like relocation of piscivore bird colonies have been put in place solely on bioenergetic models of birds, I would recommend that these type of management actions are taken as a result of combined fish-bird models.
Rating	very good

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	The team seems very qualified based on their resumes and combination of expertise.
Rating	very good

Budget

Is the budget reasonable and adequate for the work proposed?

Technical Review #2

Comments	Budget is adequate.
Rating	good

Overall

Provide a brief explanation of your summary rating.

Comments	This proposal is well developed and should provide important information that ultimately can be used to steer management actions. My main concern is the timing of the abundance survey.
Rating	very good

Technical Review #3

proposal title: Effects of avian predation on key fish species: A bioenergetics model for piscivorous birds in the Sacramento–San Joaquin Delta

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	The goals, objectives and hypotheses are clearly stated and internally consistent. The overall goal is to develop a bioenergetics model that can provide estimates of how bird predation impacts mortality to fish species of concern in the Delta. The specific hypothesis to be tested is presented in a straightforward manner: fishes of concern do not constitute significant proportions of piscivorous bird diets. The techniques they propose using include: 1) aerial surveys of bird abundance and distribution; and 2) determination of bird diets using two techniques - stable isotopes and forgut samples. With respect to its clarity, the proposal is highly redundant (i.e., repeated word for word) in places. At the same time little preliminary data is offered, and technical descriptions are too brief in sections to provide adequate technical detail for the work being proposed. Still the proposal is easy to follow, and provides a concise framework for the research proposed.
Rating	excellent

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

Technical Review #3

Comments	The conceptual model is clearly stated and the ideas are well justified. This model sets a convincing framework for how the proposed work will improve our understanding of the community structure of the Delta system. The thrust of the proposal is to better understand how avian predation impacts fish populations in the Delta. Avian predation at critical times in fish's life history may impact population maintenance of recovery. If a bioenergetics model can provide accurate estimates of how many fish of various species are being consumed during various times of the year, this information could be important for managing the system.
Rating	excellent

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	<p>The basic approach is to develop a bioenergetics model based on data surveys of avian predators abundance and distribution, and to determine what the birds are eating using stable isotope techniques and by analyzing forgut contents of sacrificed birds. Objectives are subdivided into tasks, some of which are feasible and some of which do not yet seem to be well thought out. I will address each objective separately.</p> <p>Objective 1: Assessing distribution and abundance of obligate and facultative piscivorous avifauna. This objective will be accomplished using fairly standard GIS-aerial bird survey techniques. Some typical concerns with aerial surveys include: 1) whether observers can accurately identify birds to species from 60 m in a 250 m strip, 2) inter-observer reliability and 3) whether birds are impacted by</p>
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Technical Review #3

noise. With respect to (2), there is no explanation of how inter-observer reliability will be established. Will observations be paired to observations made from ground observers? With respect to (3), there are no controls built into the proposal to assess deleterious impact to birds. For Task 1.3, too little information is provided to assess feasibility for specific land-use variables (none are listed).

Objective 2: Determining diets of piscivorous birds and their potential impacts on Delta fish populations, specifically with respect to the relative contributions of 1) emigrating salmon smolts; 2) Native vs, non-native fish, 3) endangered fish or fish species of concern.

Investigators propose to determine diet via forgut analysis (Tasks 2.1, 2.8). They then suggest that they can determine contributions of particular prey to avian diets by calculating trophic levels using stable isotopes (Tasks 2.2 - 2.9).

With respect to analyzing forgut contents, the researchers provide no preliminary data that they can analyze gut contents to species, and the inherent biases that will impact their sampling and identification techniques. For example, Votier et al. 2003 and others have demonstrated inherent biases to analysis of gut contents. In the type of model being proposed, such biases need to be considered in detail and these are not discussed, as well as a clear demonstration that species identification is feasible. In addition, no justification is given for the numbers of birds collected. This seems particularly important since some birds will come in empty. No information is given as to how a representative sample of birds for a given area will be collected, or how bird populations will be impacted. For example, if 20-30 individuals of a given species are to be analyzed for forgut contents, will all birds be sampled on the same day, in the same location? Provided researchers could, in

Technical Review #3

practice, identify forgot contents to species, this sampling regime could provide researchers with statistically robust information about whether fish species of concern were being preyed upon at a given location, time of year, time of day, etc. Alternatively, if birds are to be sampled throughout the delta, greater numbers of birds would need to be sacrificed to ensure an adequate sample size for a given location.

The alternative (or additional) approach that is proposed is to measure naturally occurring stable isotopes in consumers (various bird species) and prey (fish species of concern). Again, at least the way the research is presented, it is not clear whether the investigators understand the theory behind what they are proposing. The theory driving these types of studies is that stable-nitrogen isotope values become enriched in a stepwise progression with each trophic level in the foraging cascade (for example, see Michener & Schell 1994). In other words, a worm will have a different signature than a fish but two fish species at the same trophic level will have overlapping signatures. (Stable-carbon isotope values show only a slight enrichment with trophic level but can be used as an indicator of where the prey was collected (for example, onshore, enriched /offshore , depleted, in marine systems.)). In addition, tissues have different nitrogen-isotopic turnover rates which can allow researchers to examine diets integrated over different time scales. So tissues that have rapid isotopic turnover rates will provide information about what trophic level the animal consumed recently while those tissues that turnover more slowly may tell researchers what trophic level the animal consumed several months ago.

The issue here, however, is to determine whether a bird of Species X is eating a fish of Species X, Y or Z. (i.e, a species of concern), so discrimination needs to be made not between trophic levels, but

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	<p>within a trophic level. Stable isotopes will provide information about whether birds are eating fish, but not about what type of fish they are eating. (It is also not discussed whether geographic questions are easily transferable to freshwater habitat, but this is separate issue). Thus a study involving stable isotopes would be useful for calculating "fish" consumption by avian predators, but not provide species-specific information about what birds are eating. Consequently, it is not clear how Objective 2 goals can be met using the techniques that are outlined. In addition, it seems that investigators could dramatically increase their sample size for specific populations of birds by taking blood rather than tissue samples. It is well established that stable-isotope signatures persist in whole blood for 30 days(Hobsson and Clark, 1992; Hodum &Hobson 2000). This alternative has potentially less impact on bird populations in that they do not need to be sacrificed to get the data, but the alternative is not discussed.</p> <p>With respect to Objectives 3-5: Given the limitations stated above, a bioenergetics model that would be developed would provide information about bird predation on fish species. It is not clear how this information will be useful in determining impacts on specific species of concern.</p> <p>It seems that the researchers can determine whether or not birds are consuming fish, and to what degree.Given that the approach seems to be misguided, it is not clear whether the project will generate useful information that is ultimately useful to decision makers.</p>
Rating	fair

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success?
Is the scale of the project consistent with the objectives and within the grasp of authors?

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Comments	<p>Feasibility issues were addressed above and are reiterated here.</p> <p>With respect to analyzing forgut contents, the researchers provide no preliminary data that they can analyze gut contents to species, and the inherent biases that will impact their sampling and identification techniques. For example, Votier et al. 2003 and others have demonstrated inherent biases to analysis of gut contents. In the type of model being proposed, such biases need to be considered in detail and these are not discussed, as well as a clear demonstration that species identification is feasible. In addition, no justification is given for the numbers of birds collected. This seems particularly important since some birds will come in empty. No information is given as to how a representative sample of birds for a given area will be collected, or how bird populations will be impacted. For example, if 20-30 individuals of a given species are to be analyzed for forgut contents, will all birds be sampled on the same day, in the same location? Provided researchers could, in practice, identify forgut contents to species, this sampling regime could provide researchers with statistically robust information about whether fish species of concern were being preyed upon at a given location, time of year, time of day, etc. Alternatively, if birds are to be sampled throughout the delta, greater numbers of birds would need to be sacrificed to ensure an adequate sample size for a given location.</p> <p>The alternative (or additional) approach that is proposed is to measure naturally occurring stable isotopes in consumers (various bird species) and prey (fish species of concern). Again, at least the way the research is presented, it is not clear whether the investigators understand the theory behind what they are proposing. The theory driving these types of studies is that stable-nitrogen isotope values become enriched in a stepwise progression with each trophic</p>
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	<p>to get the data, but the alternative is not discussed.</p> <p>With respect to Objectives 3-5: Given the limitations stated above, a bioenergetics model that would be developed would provide information about bird predation on fish species. It is not clear how this information will be useful in determining impacts on specific species of concern.</p>
Rating	fair

Monitoring

If applicable, is monitoring appropriately designed (pre–post comparisons; treatment–control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	<p>Although the details are a bit sketchy, the aerial survey study has the infrastructure already in place to be well executed within the limits of the techniques being used. I would suggest better monitoring of 1) potential deleterious impact to birds by aerial surveys and 2) comparing aerial survey estimates to land surveys in some locations.</p>
Rating	good

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	<p>The bioenergetics model that comes out of this research will provide information about fish consumption by birds in the Delta. It is less likely to provide accurate information about how many fish of various species are being consumed during various times of the year, given the limitations of the techniques being employed.</p>
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Technical Review #3

Rating	good
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Additional Comments

Comments	<p>A qualified team for this project should have experience in 1) aerial survey techniques and 2) stable isotopes and 3) bioenergetic modeling. My perusal of the senior personnel suggests that none of them have an adequate background in the second two areas. It is significant that none of their own work is cited in the proposal, suggesting that this is a new area of research for this group.</p> <p>K. Miles (Research Team Leader) is an ecotoxicologist whose research has focused on eco-contaminants in estuarine and marine habitats. He has a strong publication record in this field, however, none of his work is cited in the current proposal, suggesting that he has not worked in this area before. Also, he seems to have a large "in prep" backlog, suggesting that other projects are going to come first.</p> <p>J. Ackerman , S. Spring and M. Ricca (Primary Staff) together have the experience to carry out the aerial survey work. Their responsibilities also include developing the sampling design for forgut studies. An experimental design for this project is not adequately presented here. From their publication record, there doesn't appear to be anybody with a background in stable isotopes.</p> <p>C. Marn and R. Keister (Primary Staff) will co-supervise the modeling. Marn lists no publications on her Vitae. She is a recent PhD (2004) suggesting that her work may be still in preparation, but her thesis topic "Post-hatching survival and productivity of American Avocets at Drainwater Evaporation Ponds in Tulare Basin, California" does not suggest an obvious modeling component. Keiser is a recent MS (2002) in Avian Science at UC Davis. However, her work in press</p>
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Technical Review #3

	<p>"Why bird song is sometimes like music" and "early embryonic MHC expression in the chicken" does not seem to have a modeling component that would give her the background to supervise this project.</p> <p>In short, it appears that the proposal is unusually dependent on technical consultants not directly involved with the proposal.</p>
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Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	<p>A qualified team for this project should have experience in 1) aerial survey techniques and 2) stable isotopes and 3) bioenergetic modeling. My perusal of the senior personnel suggests that none of them have an adequate background in the second two areas. It is significant that none of their own work is cited in the proposal, suggesting that this is a new area of research for this group.</p> <p>K. Miles (Research Team Leader) is an ecotoxicologist whose research has focused on eco-contaminants in estuarine and marine habitats. He has a strong publication record in this field, however, none of his work is cited in the current proposal, suggesting that he has not worked in this area before. Also, he seems to have a large "in prep" backlog, suggesting that other projects are going to come first.</p> <p>J. Ackerman, S. Spring and M. Ricca (Primary Staff) together have the experience to carry out the aerial survey work. Their responsibilities also include developing the sampling design for foraging studies. An experimental design for this project is not adequately presented here. From their publication record, there doesn't appear to be anybody with a background in stable isotopes.</p>
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	<p>C. Marn and R. Keister (Primary Staff) will co-supervise the modeling. Marn lists no publications on her Vitae. She is a recent PhD (2004) suggesting that her work may be still in preparation, but her thesis topic "Post-hatching survival and productivity of American Avocets at Drainwater Evaporation Ponds in Tulare Basin, California" does not suggest an obvious modeling component. Keiser is a recent MS (2002) in Avian Science at UC Davis. However, her work in press "Why bird song is sometimes like music" and "early embryonic MHC expression in the chicken" does not seem to have a modeling component that would give her the background to supervise this project.</p> <p>In short, it appears that the proposal is unusually dependent on technical consultants not directly involved with the proposal.</p>
Rating	fair

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	The research team is asking for 3 years. Most of these funds are going to salary support for the research team. The project doesn't warrant this expenditure in its current state.
Rating	fair

Overall

Provide a brief explanation of your summary rating.

Comments	The overall goal is to develop a bioenergetics model that can provide estimates of how bird predation impacts mortality to fish species of concern in the Delta. While there is considerable justification for this type of study, the proposal fails in providing a
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	coherent plan to reach this goal. There is no indication that the research team has the scientific expertise necessary to design and follow through on their stated goals. The experimental design for the empirical work and associated preliminary data are insufficient to justify an expenditure of \$775,694.
Rating	fair

